

# Executive Summary

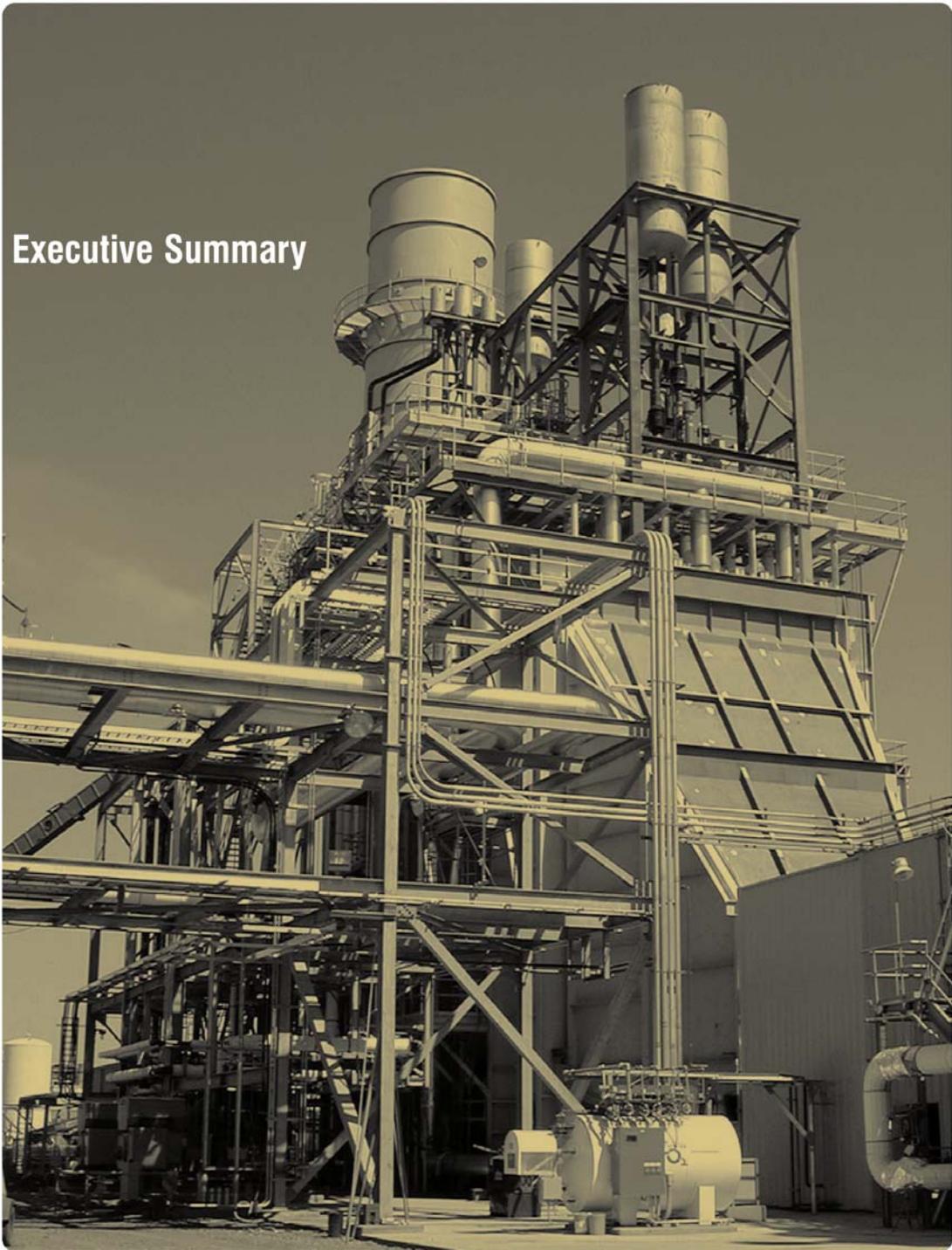


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# EXECUTIVE SUMMARY

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The *California Energy Outlook: Electricity and Natural Gas Trends Report* responds to the requirements of Section 25553 of the Public Resources Code. These requirements were enacted by Assembly Bill (AB) 970 (Ducheny) Chapter 329, Statutes of 2000, and signed into law by Governor Davis. Among other provisions, AB 970 requires the Energy Commission to provide the Governor, the Legislature and the public with accurate information on California's electricity supply, demand and conservation trends.

The report presents the energy supply and demand trends of the past decade to provide perspective on current events, along with an overview of expected developments for 2001 and a long-term demand outlook through 2010. The energy trends cover both electricity and natural gas developments. Electricity generation developments have important implications to the natural gas market and fuel delivery infrastructure, given that natural gas is the single largest fuel source for California electricity generation.

The report focuses on key events and trends that affect near-term risks to ensuring an adequate supply electricity. The report also examines electricity demand, load management, and natural gas infrastructure developments. Although many market-design issues need to be resolved to improve competition and maintain system reliability, this report does not address market structure problems. The California Independent System Operator, Federal Energy Regulatory Commission, utility distribution companies and academic institutions are studying the various structural problems with California's market design.

The remainder of the "Executive Summary" provides an overview of recent developments and issues that are addressed in the report.

## Background

Electricity and natural gas markets brought unexpected developments in 2000, resulting in exorbitant prices and serious reliability risks. These developments were due to two key problems: limited supplies of electricity and natural gas throughout the west and flaws in the design of the new market which allowed market participants to directly influence wholesale prices.

Although normal fluctuations in the natural gas market helped increase electricity generation costs, some allege that market manipulations increased electricity and natural gas costs beyond reasonable competitive levels. Whatever the causes, California's efforts to substitute competition for cost-based regulation in the generation sector of the electricity industry have fallen substantially short of expectations.

Electric utilities have already lost billions of dollars attempting to serve load, pushing the Nation's largest utility into bankruptcy. Consequently, the State committed billions of dollars

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to purchase power to restore order to the electricity market. All of these costs may eventually be passed on to consumers, along with the risks that the energy markets may affect the California economy as a whole.

The transition to a workable competitive market is clearly in jeopardy and will require stronger government involvement to protect the interests of California citizens. To begin to address this need, the Governor has developed an Energy Plan, and numerous Legislative bills have now been proposed to stabilize the market volatility and moderate risks for this summer's and next year's peak load season. However, the crisis can only be resolved if both state and federal regulators take measures designed to return the markets to some semblance of normal operation.

Chapter 1 explains the purpose and background information on the different topics covered in the report. The following sections provide a synopsis of each chapter in the report.

## **California's Electricity System**

Chapter 2 provides a general description of the bulk electricity system. This chapter describes the current generation system, how the system has developed over the years, and the trade relationship that the interconnected transmission grid creates with the rest of the western region. This chapter also compares California and United States energy trends to add perspective and discusses some of the myths and misconceptions of the market.

An understanding of the electricity resource characteristics and transmission network provides the basis for analyzing future needs and market developments. California is a regional power system that includes a diverse mix of natural gas, renewable, hydroelectric and nuclear generation resources. California imports between 20 to 30 percent of its electricity needs from eleven western states, and western Canada and Mexico. The interconnection of regional power systems throughout the west provides trade opportunities enhanced by the diversity of generation resources and regional differences in load patterns.

## **Energy Markets in Transition**

Chapter 3 summarizes recent developments in the California electricity market. This chapter includes a general overview of the price volatility in the wholesale power market, the decline in system reliability, and retail price developments. This chapter sets the stage for understanding the current electricity problems.

Although problems were encountered from the beginning of industry restructuring, the market functioned without serious problems during its first two years of operation and market prices tracked expectations. However, California's electric system infrastructure and

the new market institutions developed significant problems in the summer of 2000, which continued and even worsened during the winter.

## Electricity Supply Adequacy in California

Chapter 4 explores the uncertainty about whether the western region has adequate electricity generating capacity to serve California's needs. This chapter looks at recent electric generation supply trends and provides an outlook for the next several years. While several thousand megawatts of new power plant capacity are under construction in the state, even more are currently under review in the Energy Commission's siting process.

Electricity generation reserves have been consistently declining in California and the West since 1993. As the Independent System Operator's AB 1890 Section 350 report<sup>1</sup> and the Energy Commission's Heat Storm Study<sup>2</sup> note, California has faced increasing supply adequacy risks for several years. A decline in reserve capacity has made the State's electric system more vulnerable to market manipulations and disruptions due to unexpected events, such as higher than expected outages of generation facilities. During some of these events, the Independent System Operator directed utilities to curtail loads to maintain the overall reliability of the transmission grid. Most curtailments occurred during the winter months when load is significantly lower than summer peak demand periods.

New generation capacity and demand reduction measures that are needed to reverse this trend are currently under development. The outlook for meeting the 2001 peak demand is encouraging, especially with the mild weather California has enjoyed to date. The outlook for the next several years is optimistic.

## Electricity Consumption Trends

Chapter 5 provides an overview of recent California demand trends and an outlook for the next decade. This chapter also provides an overview of recent trends in electricity demand growth by region and industry sectors, including the changes in electricity demand under normal and above average temperature conditions, since temperatures vary from year to year. A summary of the Commission's latest demand outlook is included, with an updated forecast expected at the end of the year.

California electricity peak demand continues to grow at about 2 percent per year on average. However, some regions are experiencing explosive growth, such as in the Silicon Valley

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<sup>1</sup> The *AB 1890 Section 350 Report* can be found on the ISO website at: [<http://www.caiso.com/thegrid/operations/TRR/index.html>] and *Task E, Assessment of Resource Supply* at: [<http://www.caiso.com/thegrid/operations/TRR/taskE7-14.pdf>]

<sup>2</sup> *High Temperatures & Electricity Demand: An Assessment of Supply Adequacy in California, Trends and Outlook* can be found at: [[http://www.energy.ca.gov/electricity/1999-07-23\\_HEAT\\_RPT.PDF](http://www.energy.ca.gov/electricity/1999-07-23_HEAT_RPT.PDF)]

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region, causing unique local system problems. In addition, new residential development has shifted to the Central Valley region, increasing peak air conditioning loads that fluctuate with temperature conditions. As the population continues to grow, technological advances, energy-efficiency improvements, and increased competition in energy commodities are expected to moderate future energy demand increases.

## **Energy Efficiency Resource Opportunities**

Chapter 6 summarizes current efficiency programs, including the past savings from efficiency improvements. Efficiency programs reduce the energy dependence of California's economy, make businesses more competitive, and allow consumers to save money and live more comfortably.

As an energy efficiency program, load-reduction opportunities are an important element in balancing supply requirements. Energy efficiency programs defer the need for new generation or transmission capacity, prevent environmental degradation, and help consumers control their utility bills. Since 1975, the displaced peak demand from past efficiency programs has been roughly the equivalent of eighteen 500-megawatt power plants.

Temporary programs are now being put in place to provide immediate relief in the summers of 2001 and 2002. Although these programs target demand reductions during the summer peak demand period, many programs will also produce year-round savings through improvements to lighting, water pumping, and heating and cooling system efficiency. There is also an observable change in consumer behavior due to recent high prices, the number of Independent System Operator emergency alerts, and extensive press coverage of the energy crisis.

## **Western Natural Gas Systems**

Chapter 7 provides an overview of the natural gas production and delivery system. This chapter includes a general description of the natural gas pipeline system, the regions where proven reserves and potential resources are located, California production trends and a long-term supply outlook. To understand the mechanics of the natural gas market in California, it is essential to understand all of the market fundamentals.

The clean-burning characteristics of natural gas and its price have made it a premium fuel of choice in California, especially for power generation. However, gas produced in the state satisfies only about 15 percent of the statewide demand. The remainder is obtained from other western states, Alberta and British Columbia. A complex grid of pipelines transports natural gas from producing regions to California consuming regions.

Overall, adequate supplies of natural gas are expected to be available from these regions throughout the next decade. In today's competitive market environment, changes in supply, demand, or price in one region affects all other regions.

## **California Natural Gas Developments**

Chapter 8 assesses the current and future natural gas market issues confronting California. This chapter includes an overview of consumption trends, supply adequacy concerns, pipeline constraints, and storage needs. Although natural gas supplies are expected to remain generally plentiful over the long term, market forces and regulatory events may cause significant short-term fluctuations in natural gas supplies and prices. California has already experienced fluctuations and price volatility during the past year.

Two issues are likely to affect the supplies of natural gas in California. First, infrastructure issues are likely to constrain natural gas supplies over the next year. Pipeline capacity and ability to refill natural gas storage facilities will be limited over the next year. These problems may limit the availability of fuel supplies to meet seasonal demands though 2001 and early 2002. Second, the natural gas and electricity markets are tied together, with natural gas being the fuel of choice. Natural gas consumption by power plants is volatile since electricity demand may fluctuate significantly depending on weather variations. Such uncertainties raise concerns about the future impact of supply adequacy on electricity markets.

## **Synopsis of the Technical Appendices**

The following is a synopsis of the technical appendices of the report. The appendices include several study topics that are beyond the scope of the AB 970 reporting requirements.

## **Demand Responsiveness in Electricity Markets**

Appendix A describes how demand responsiveness programs could give consumers and other end-users more control over their electricity consumption. This appendix provides a discussion about why consumers do not respond to real price fluctuations, a description on how demand responsiveness could work and an overview of activities currently underway to provide the right pricing signals to consumers.

Currently, consumers have little motivation to reduce consumption when prices to generate electricity are high and supplies are tight, threatening the reliability of the system. This problem arises because consumers do not directly experience the high prices during high demand periods, as consumer rates are fixed due to regulatory requirements. Moreover, consumers lack the means to respond even if they wanted to because they are not informed of

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the hourly prices in the wholesale markets. Furthermore, consumers do not have the meters to measure their hourly consumption patterns.

Instead of a market where demand elasticity is governed by consumer preferences and technology costs, consumption behavior is moderated by legal requirements that fix rates. Changes that increase demand responsiveness require an explicit focus on the design of the retail market structure.

## **Wholesale Electricity Pricing in a Sustainable Market**

Appendix B provides an overview of the different factors that affect wholesale electricity prices. This appendix illustrates the price levels that an ideal market would likely produce if California were to have a sustainable market. “Sustainable” means to have a structure that is fair to both buyers and sellers, encouraging continued market transactions.

Any market design must provide generators with enough revenue to maintain the operation of some of the existing infrastructure and attract additional investment as needed. Even if analysts can ascertain what would be a reasonable cost of generation, it is still extremely difficult to develop a market design that will send the appropriate price signals to generators for new development. The difficulty stems from the natural features of electricity as a commodity.